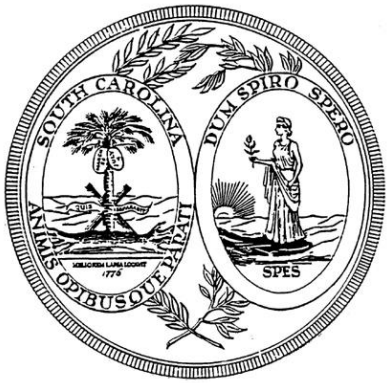
South Carolina Academic Standards and Performance Indicators for Science 2014



Instructional Unit Resource

6th Grade

South Carolina Academic Standards and Performance Indicators for Science 2014
Sixth Grade Science Instructional Unit Resource

As support for implementing the *South Carolina Academic Standards and Performance Indicators for Science 2014*, the standards for Sixth Grade have been grouped into possible units. In the Overview of Units below, the titles for those possible units are listed in columns. Refer to the Overview document to note these unit titles and how Standards, Conceptual Understandings, Performance Indicators, Science and Engineering Practices, and Crosscutting Concepts align. Following the Overview of Units, an Instructional Unit document is provided that delivers guidance and possible resources in teaching our new *South Carolina Academic Standards and Performance Indicators for Science 2014*. The purpose of this document is to provide guidance as to how all the standards in this grade may be grouped into units and how those units might look. Since this document is merely guidance, districts should implement the standards in a manner that addresses the district curriculum and the needs of students. This document is a living document and instructional leaders from around the state will continuously update and expand these resource documents. These documents will be released throughout the 2016-2017 school year with the intentionality of staying ahead of instruction. Teachers should also note that links to the Standards document, A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, the SEP Support Document, and the Support Document 2.0 are embedded throughout the Instructional Unit format for reference.

Acknowledgments

Jean Baptiste Massieu, famous deaf educator, made a statement that is now considered a French proverb. “Gratitude is the memory of the heart. Indeed, appreciation comes when you feel grateful from the depths of your heart. The head keeps an account of all the benefits you received and gave. But the heart records the feelings of appreciation, humility, and generosity that one feels when someone showers you with kindness.” It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by teachers and instructional leaders across the state that have made and are continuing to make the Instructional Unit Resources possible.

Grade 6 Overview of Units

Unit 1		Unit 2		Unit 3		Unit 4	
EARTH SCIENCE: EARTH'S WEATHER AND CLIMATE		PHYSICAL SCIENCE: ENERGY TRANSFER AND CONSERVATION		LIFE SCIENCE DIVERSITY OF LIFE – CLASSIFICATION AND ANIMALS		LIFE SCIENCE: DIVERSITY OF LIFE- PROTISTS, FUNGI AND PLANTS	
Standard		**Standard**		**Standard**		**Standard**	
6.E.2		6.P.3		6.L.4		6.L.5	
Conceptual Understanding		**Conceptual Understanding**		**Conceptual Understanding**		**Conceptual Understanding**	
6.E.2A	6.E.2B	6.P.3A	6.P.3B	6.L.4A	6.L.4B	6.L.5A	6.L.5B
Performance Indicators		**Performance Indicators**		**Performance Indicators**		**Performance Indicators**	
6.E.2A.1 6.E.2A.2 6.E.2A.3	6.E.2B.1 6.E.2B.2 6.E.2B.3 6.E.2B.4	6.P.3A.1 6.P.3A.2 6.P.3A.3 6.P.3A.4 6.P.3A.5 6.P.3A.6	6.P.3B.1 6.P.3B.2	6.L.4A.1 6.L.4A.2	6.L.4B.1 6.L.4B.2 6.L.4B.3 6.L.4B.4 6.L.4B.5	6.L.5A.1 6.L.5A.2	6.L.5B.1 6.L.5B.2 6.L.5B.3 6.L.5B.4 6.L.5B.5
***Science and Engineering Practices**		***Science and Engineering Practices**		***Science and Engineering Practices**		***Science and Engineering Practices**	
6.S.1A.2 6.S.1A.4 6.S.1A.6 6.S.1A.7		6.S.1A.1 6.S.1A.2 6.S.1A.3 6.S.1A.4 6.S.1A.6 6.S.1B.1		6.S.1A.2 6.S.1A.4 6.S.1A.6 6.S.1A.8		6.S.1A.2 6.S.1A.3 6.S.1A.4 6.S.1A.6	
***CrossCutting Concepts**		***CrossCutting Concepts**		***CrossCutting Concepts**		***CrossCutting Concepts**	
1, 2, 4, 5, 7		1, 2, 3, 4, 5, 7		1, 2, 3, 4, 5, 6, 7		1, 2, 3, 4, 5, 6, 7	

**Teachers have the discretion to enhance the selected SEPs and CCCs.*

Unit Title
Earth Science: Weather & Climate
Standard http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf
6.E.2 The student will demonstrate an understanding of the interactions within Earth's systems (flow of energy) that regulate weather and climate.

Conceptual Understanding
6.E.2A. Earth's atmosphere, an envelope of gases that surround the planet, makes conditions on Earth suitable for living things and influences weather. Water is always moving between the atmosphere (troposphere) and the surface of Earth as a result of the force of gravity and energy from the Sun. The Sun is the driving energy source for heating Earth and for the circulation of Earth's atmosphere
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**

Air pressure	Altitude	Troposphere	Stratosphere	Thermosphere
Exosphere	Atmospheric gases	Nitrogen	Oxygen	Carbon dioxide
Trace gases	Water vapor	Fossil fuels	Greenhouse gases	Water cycle
Evaporation	Condensation	Precipitation	Transpiration	Crystallization
Surface runoff	Groundwater flow	Dew	Frost	Ozone
Greenhouse effect				

Performance Indicators

Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's

6.E.2A.1 *Develop and use models* to exemplify the properties of the atmosphere (including the gases, temperature and pressure differences, and altitude changes) and the relative scale in relation to the size of Earth.

6.E.2A.2 *Critically analyze scientific arguments* based on evidence for and against how different phenomena (natural and human induced) may contribute to the composition of Earth's atmosphere.

6.E.2A.3 *Construct explanations* of the processes involved in the cycling of water through Earth's systems (including transpiration, evaporation, condensation and crystallization, precipitation, and downhill flow of water on land).

***Science and Engineering Practices**

Support for the guidance, overviews of learning progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

6.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

6.S.1A.6 Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

6.S.1A.7 Construct scientific arguments to support claims, explanations, or designs using evidence from observations, data, or informational texts

***Cross Cutting Concepts (http://www.nap.edu/read/13165/chapter/8)**

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

1. Patterns: The National Research Council (2012) states "observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them" (p. 84). *Earth's atmosphere influences patterns found in weather.*

2. Cause and Effect: The National Research Council (2012) states "mechanism and explanation events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts." (p. 84).
Different phenomena (natural and human induced) may contribute to the composition of Earth's atmosphere.

4. Systems and System Models: The National Research Council (2012) states that "defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering." (p. 84). *The envelope of gases that surround Earth that make up Earth's atmosphere and the water cycle in constant motion in the trophospehre make the systems on Earth suitable for life.*

5. Energy and Matter: Flows, Cycles, and Conservation: The National Research Council (2012) states that "tracking fluxes of energy and matter into, out of, and within systems helps one understand the system's possibilities and limitations." (p. 84).
The force of gravity and energy from the sun keeps the water cycle in motion. The sun is the major energy source for heating the earth and for the circulation of Earth's atmosphere.

7. Stability and Change: The National Research Council (2012) states that "for natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study" (p. 84). *Different phenomena (natural and human induced) may contribute to the composition of Earth's atmosphere.*

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Prior Knowledge
● K.E.3: The student will demonstrate an understanding of daily and seasonal weather patterns. ● 2.E.2: The student will demonstrate an understanding of the daily and seasonal weather patterns. ● 4.E.2: The student will demonstrate an understanding of the water cycle and weather and climate patterns.
Subsequent Knowledge
● H.E.5: The student will demonstrate an understanding of the dynamics of Earth's atmosphere. ● H.E.6: The student will demonstrate an understanding of Earth's freshwater and ocean systems.

Possible Instructional Strategies/Lessons **Strategies and lessons that will enable students to master the standard and/or indicator.**
● Create a pie graph showing the composition of Earth's atmospheric gases which includes qualitative and quantitative analysis.

- Earth's Atmosphere Model Use logic problem clues to construct a scale model of Earth's Atmospheric Layers. A resource can be found at: http://www.csr.utexas.edu/grace/education/activities/pdf/Scale_of_Earth.pdf

- Construct a temperature graph which shows what happens to temperatures in Earth's atmospheric layers which includes qualitative and quantitative analysis.

- Water Wonders Simulate what happens to a drop of water as it moves within the water cycle. This resource can be found at: http://wps.ablongman.com/wps/media/objects/1513/1550154/%2344_Water_Wonders.pdf

- Water Cycle Song Use a water cycle song to create a cause and effect flow chart that explains each process of the water cycle. This resource can be found at: https://www.youtube.com/watch?v=okZBiy_IdBA

- Create a diagram that illustrates the water cycle. Include a title, picture, labels, and caption. Your caption should explain how water is cycled in the atmosphere.

- Investigations of Acid Rain: Students can conduct a scientific investigation to analyze the causes and effects of acid rain. One example can be found here https://www.teachengineering.org/activities/view/cub_air_lesson06_activity2

Resources

- eSchooltoday: Check out the links to the Water Cycle, Ozone Depletion, and Water Pollution. This resource can be found at: http://www.eschooltoday.com/

- The Greenhouse Effect: This resource can be found at: https://www3.epa.gov/climatechange/kids/basics/today/greenhouse-effect.html

- Precipitation Education: This resource can be found at: https://pmm.nasa.gov/education/water-cycle

- Check out the Water Cycle: This resource can be found at: http://studyjams.scholastic.com/studyjams/

Sample Formative Assessment Tasks/Questions **Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)**
• Create "Tour of the Atmosphere" Infographic or travel brochure in order to demonstrate mastery on the composition and properties of Earth's atmospheric layers. The brochure should include temperatures, depths, and at least two activities within each layer. Also include a model in scale of how the atmosphere appears from Earth's surface. Information used for this assessment could be found in labs, notebooks, and practice sheets • Select one process of the water cycle. Design a demonstration to show what happens. Include title, materials, and a summary of what your demonstration shows. • Create an Infographic or poster on the causes and effects of human and natural impacts on Earth's atmosphere. Include an explanation of how greenhouse gases harm the atmosphere, how those gases are put in the atmosphere, and what can be changed to lessen the occurrence.

Unit Title
Earth Science: Weather & Climate
Standard http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf
6.E.2 The student will demonstrate an understanding of the interactions within Earth's systems (flow of energy) that regulate weather and climate.

Conceptual Understanding
6.E.2B. The complex patterns of changes and movement of water in the atmosphere determined by winds, landforms, ocean temperatures and currents, and convection are major determinants of local weather patterns and climate. Technology has enhanced our ability to measure and predict weather patterns.
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**

Air mass	Air pressure	Humidity	Temperature	Anemometer
Hygrometer	Sling psychrometer	Thermometer	Barometer	Wind vane
Rain gauge	Cirrus	Stratus	Cumulus	Cumulonimbus
Isobar	Isotherm	Satellite	RADAR	Air mass
Warm front	Cold front	Stationary front	Occluded front	Pressure systems
Hurricane	Tornado	Thunderstorm	Flood	Drought
Jet stream	Coriolis Effect	Convection	Currents	Westerlies
Easterlies	Trade winds	Climate regions	Ocean currents	Gulf Stream

Performance Indicators

Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's

6.E.2B.1 *Analyze and interpret data* from weather conditions (including wind speed and direction, air temperature, humidity, cloud types, and air pressure), weather maps, satellites, and radar to predict local weather patterns and conditions.

6.E.2B.2 *Develop and use models* to explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and storms (including thunderstorms, hurricanes and tornadoes).

6.E.2B.3 *Develop and use models* to represent how solar energy and convection impact Earth's weather patterns and climate conditions (including global winds, the jet stream, and ocean currents).

6.E.2B.4 *Construct explanations* for how climate is determined in an area (including latitude, elevation, shape of the land, distance from water, global winds, and ocean currents).

***Science and Engineering Practices**

Support for the guidance, overviews of learning progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance

expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

6.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

6.S.1A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.

6.S.1A.6 Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

***Cross Cutting Concepts** **(http://www.nap.edu/read/13165/chapter/8)**

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

1. Patterns: The National Research Council (2012) states "observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them" (p. 84). *Analyze and interpret data from weather conditions to predict weather pattern and conditions.*

2. Cause and Effect: The National Research Council (2012) states "Mechanism and Explanation Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts " (p. 84). *Relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and storms.*

4. Systems and System Models: The National Research Council (2012) states "Defining the system under study—specifying its boundaries and making explicit a model that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering." (p. 84). *The clouds, temperature, precipitation, winds and storms that can be observed are dependent on interactions between global systems and local conditions such as geography, latitude, moisture levels and solar energy absorption.*

5. Energy and Matter: Flows, Cycles, and Conservation: The National Research Council (2012) states "Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Solar energy and convection impact Earth's weather patterns and climate conditions (including global winds, the jet stream, and ocean currents).*

7. Stability and Change: The National Research Council (2012) states "For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study" (p. 84). *Climate for particular areas is determined by varying latitude, elevation, shape of the land, distance from water, global winds, and ocean currents.*

Prior Knowledge
● 4.E.2: The student will demonstrate an understanding of the water cycle and weather and climate patterns. ● 5.E.3: The student will demonstrate an understanding of how natural processes and human activities affect the features of Earth's landforms and oceans.
Subsequent Knowledge
● H.E.6: The student will demonstrate an understanding of Earth's freshwater and ocean systems.

Possible Instructional Strategies/Lessons
Strategies and lessons that will enable students to master the standard and/or indicator.

- Use logic clues to classify clouds based on their composition, altitude, and characteristics.
- Use models to describe the characteristics of fronts and how weather is impacted.
- Using common items, create a weather instrument and record the data over a period of seven days - the critique the accuracy or inaccuracy of your instrument.
- Prepare a "news report" characterizing one of five significant hurricanes in United States history.
- Use a simulation to analyze and graph land and sea breezes over a 24 hour time period.
- Compare and contrast El Nino and La Nina.
- Map the main ocean currents.
- Conduct a scientific investigation about how solar energy reflects or absorbs thermal energy.

- Conduct a scientific investigation of how various earth materials absorb or reflect heat.
- Use weather data, maps, and satellite information to predict weather.
- Use cloud-type to predict the weather in your area.

Resources

- NASA Space Place: Learn about different cloud types. This resource can be found at: http://spaceplace.nasa.gov/cloud-scramble/en/
- Weather Wiz Kids: Website developed by meteorologist, Crystal Wicker, to allow children to learn more about the weather and meteorology. This resource can be found at: http://www.weatherwizkids.com/
- eSchooltoday: Check out the links to the Clouds, Winds, Floods, Droughts, Hurricanes, and Tornadoes. This resource can be found at: http://www.eschooltoday.com/
- NSTA Interactive: Virtual simulation of land and sea breeze combined. This resource can be found at: http://oceanservice.noaa.gov/education/pd/oceans_weather_climate/media/sea_and_land_breeze.swf
- Study Jams: Check Out the Water Cycle. This resource can be found at: http://studyjams.scholastic.com/studyjams/

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

- Design a demonstration which simulates the three fronts (cold, warm, and stationary). Include title, materials, and a summary of what your demonstration shows.

- Create a family-friendly infographic or brochure informing about storm causes and storm safety. Include safety for hurricanes, tornadoes, and blizzards. Include a description of the storm and the causes. With a provided US Map, key in the prominent areas for each of the storm types. Provide step-by-step procedures of what needs to be done. If needed, include items that should be included in a survival kit.

- "Hurricane or Tornado?" Create an argumentative essay about which storm would you choose to endure. Include the causes, duration, and types of damage.

- Design a weather station blueprint which contains all of the instruments to measure weather factors. Include a title, labels with description and the measurement units for each instrument, and a caption. Your caption should include the purpose of a weather station.

- Using the Station Model for recording weather data, track and record the weather for 5 days.

- "Zoo-Mania!" Create a zoo with exhibits from all climate regions. Select a name for each exhibit. Choose animals and plants suitable for each climate region. You will also write a description of each exhibit. Include the specific conditions under which each exhibit should be maintained. You must include temperature and precipitation. Briefly name and describe the climate region and the animals and plants you have selected. Fun facts are also expected. Finally, include a map showing where the climate regions are located.

References

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